MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

BMT1014 –MANAGERIAL MATHEMATICS
(All sections / Groups)

30th MAY 2018
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of 5 **pages** including cover page and mathematical formulas with **4 Questions** only.
2. Attempt **ALL** questions and write your answers in the Answer Booklet provided.
3. The candidate is allowed to use scientific calculators that are permitted to be used in the examination.

Question 1 (25 marks)

a) Find an equation of the line passing through $(2,-5)$ and perpendicular to the line whose equation is $5y-x-7=0$. **(7 marks)**

b) A manufacturer sells a product at RM28.50 per unit, selling all that is produced. The fixed cost for this store is RM2004 and the variable cost is RM22.50 per unit.

   i. Find cost, revenue and profit function. **(4 marks)**
   ii. At what level of production will the break even point occur? **(2 marks)**
   iii. Find the profit when 920 units are produced. **(2 marks)**
   iv. Find the loss when 260 units are produced. **(2 marks)**

c) Given a quadratic function $f(x)=x^2-2x-8$,

   i. Find the vertex. **(3 marks)**
   ii. Find the intercepts. **(2 marks)**
   iii. Sketch the graph of the function. **(3 marks)**

Question 2 (20 marks)

A toy manufacturer preparing production schedule for two new toys, trains and buses. Each type requires the use of time on Machine A, Machine B and Finishing as given in the following table:

	Trains	**Buses**
Machine A	2 hours	2 hours
Machine B	3 hours	2 hours
Finishing	2 hours	1 hour

The maximum numbers of hours available per week for Machine A, B and Finishing are 100, 120 and 70 respectively. The profit per unit on trains is RM6 and buses is RM4.

a) Formulate a linear programming model for this problem. **(5 marks)**
b) Graph the linear inequalities of the constrains in the graph paper provided. Shade the feasible region. **(8 marks)**
c) State the coordinates of each corner points of feasible region from the graph. How many of each toy should be made per week in order to maximize profit? **(7 marks)**

Continued...

Question 3 (25 marks)

a) What is the accumulated amount if RM1400 is invested for 5 years in an account that pays 9% annual simple interest? **(4 marks)**

b) Find the present value of RM2150 due after 4 years if the interest rate is 6% compounded annually. **(5 marks)**

c) What is the effective rate that corresponds to a nominal rate of 22% compounded semiannually? **(4 marks)**

d) Equal payments of RM250 are to be deposited in a saving account at the end of each month for 10 years. Find the future value of the annuity if interest is at 30% compounded monthly. **(6 marks)**

e) A company set up a sinking fund to expand their business. The fund earns 12% interest compounded quarterly. Find the quarterly payment in the sinking fund if they need RM35,000 at the end of 6 years. **(6 marks)**

Question 4 (30 marks)

a) Differentiate the following function:

i. $f(x) = 70 - 2x^4 + 3\ln x + e^x$ **(3 marks)**

ii. $f(x) = (3x^2 - 4)(5x + 2)$ by using the **Product Rule.** **(5 marks)**

b) Suppose that the cost function of producing x units of a product given by $C(x) = 7x^3 + 3x^2 - 2x + 6$. Find the

i. marginal cost function, **(3 marks)**

ii. marginal profit function if the revenue function is $R(x) = 9x^3 - 2x^2 + 2$. **(5 marks)**

c) Find the area of the region bounded by the graphs of $y = x + 2$ and $y = x^2$ from $x = 0$ to $x = 2$. **(5 marks)**

d) If $f(x, y) = 5x^3y^4 + 2x^2y - xy + 2018$, find

i. $f_y(x, y)$ **(3 marks)**

ii. $f_{yx}(x, y)$ **(3 marks)**

iii. $f_{yy}(x, y)$ **(3 marks)**

End of Page.

Course: Managerial Mathematics
Code: BMT1014

Summary of Principal Formulas and Terms

Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
(ii) Accumulated amount, $A = P\,(1 + rt)$

Compound Interest

(i) Accumulated amount, $A = P(1+i)^n$, where $i = \dfrac{r}{m}$, and $n = mt$
(m = number of conversion periods per year)

(ii) Present value for compound interest, $P = A(1+i)^{-n}$

Effective Rate of Interest

$$r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$$

Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ (S = future value of ordinary annuity of n payments of R dollars periodic payment)

Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$ (P = present value of ordinary annuity of n payments of R dollars periodic payment)

Amortization Formula

$$R = \frac{Pi}{1-(1+i)^{-n}}$$ (R = periodic payment on a loan of P dollars to be amortized over n periods)

Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1}$$ (R = periodic payment required to accumulate S dollars over n periods)

Basic Rules of Differentiation

(a) Constant, $f(x) = c$: $f'(c) = 0$
(b) Power rule, $f(x) = x^n$: $f'(x) = nx^{n-1}$
(c) Constant multiple a function, $cf(x)$: $cf'(x)$
(d) Sum or difference rule, $f(x) \pm g(x)$: $f'(x) \pm g'(x)$

(e) Product rule, $f(x) = u.v$: $f'(x) = uv' + vu'$

(f) Quotient rule, $f(x) = \frac{u}{v}$; $f'(x) = \frac{vu' - uv'}{v^2}$

(g) Chain rule: Derive $g[f(x)] = g'[f(x)]f'(x)$

(h) General power rule: Derive $[f(x)]^n = n[f(x)]^{n-1} f'(x)$

(i) Exponential function:
$f(x) = e^x$; $f'(x) = e^x$
$f(x) = e^{f(x)}$; $f'(x) = e^{f(x)} f'(x)$

(j) Logarithmic function:

Derive $\ln x = \frac{1}{x}$

Derive $(\ln u(x)) = \left(\frac{1}{u(x)}\right)[u'(x)]$

Basic Rules of Integration

(a) $\int k\, dx = kx + C$

(b) $\int x^n\, dx = \frac{x^{n+1}}{n+1} + C$

(c) $\int kf(x)\, dx = k \int f(x) dx$

(d) $\int (f \pm g)(x) = \int f(x) dx \pm \int g(x) dx$

(e) $\int e^x dx = e^x + C$

(f) $\int \frac{1}{x}\, dx = \ln x + C$

Determining Relative Extrema

$$D(x, y) = f_{xx} f_{yy} - (f_{xy})^2$$

If $D > 0$ and $f_{xx} > 0$, relative minimum point occurs at (x, y).
If $D > 0$ and $f_{xx} < 0$, relative maximum point occurs at (x, y).
If $D < 0$, (x, y) is neither maximum nor minimum.
If $D = 0$, the test is inconclusive.